CENTRAL INTELLIGENCE AGENCY

INFORMATION REPORT

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COUNTRY USSR

SUBJECT Activities and Personnel of the Group of German Specialists under Dr. Christian

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REFERENCES

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Attached is a ten-page report on the members of Dr. Christian's group and their work in the USSR

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Enclosures: 15 sketches (Air 10, Navy 10, Army 6

Distribution: Air -
Navy -
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Aerodynamics	Graduate Engineer Eberhard Breyer and Werner Hauschild, student of engineering.
Electric Controls	Graduate Engineers Bodo Jordan and Guenther Rettschlag.
Mathematical Calculations	Dr. Phil. Oskar Kraus and Dr. Alfred Schicht.

Designer Group:

Gears	Graduate Engineers Ludwig Hloschek and Werner Schmitz.
Turbines	Graduate Engineers Karl Karstens or Kastens, Moritz or Ernst Arndt, and Engineer Altwein, (fnu).
Combustion Chambers	Graduate Engineer Lillge or Luelge, (fnu), and Engineers Eugen Kirchner, Herbert-Wilhelm Troesken, and Paul Zenke.
Turbine Blades	Engineer Walter Hellmann.

Drafting Office:

Chief	Engineer Mayerle, (fnu).
Draftsmen	Engineers Joachim Jahn, Ernst Schroeder, Erich Grossmann, Gerhard Schultze, Gustav Lukas, Hermann Schepers, Graduate Engineer Heinz Mirus, and technicians Erwin Rhode or Rode, Rudolf Wolf, and Hans Peetz.
Translations (English to German)	Graduate Engineers Hans Dietrich v. Killisch-Horn and Siegfried Gundermann.
Graphic Presentation	Joachim Weigand.
Administration office	Graduate Engineer Walter Luerzel.
Registration	Heinz Enkroth.
Russian Interpreters	Engineer Michael Meyer or Mayer and Hans Horch, who called himself Horn in the U.S.S.R.
Typing Section	Graduate Engineer Walter Lampe, a former navy architect, Antifa member, and Wolfgang Christian, who was being tained as an engineer by Kraus and Schicht.

Christian, Eberschulz, Freese, Meyer, Jordan, Schicht, Karsten, and Zenke are still in the U.S.S.R. Some of them stayed in Chelyabinsk and some in Kazan until they all joined a group of deported German experts in Kuibyshev. (2)

3. At first, Dr. Christian worked out the research program, until the Soviets gave specific orders, the contents of which were known only to Dr. Christian, Graduate Engineer Eberschulz, and to the interpreter Meyer. Studies composed by this group were first checked by Professor Strachowitz, then by a commission of Junkers engineers in Moscow (sic) working under Graduate Engineer Ferdinand Brandtner, and finally they were forwarded to the Ziam and Zagi Institutes. The Soviets placed great value on the perfect and artistic representation and bindings (Einbaende) of all plans and design sketches.

4. Soviet liaison personnel who were either permanently assigned to the German group, or who came at short intervals for inspections, included Major General Professor Kravchenko, (fnu), an outstanding expert in the field of thermodynamics, and in charge of the utilization of PW experts in technical fields; MVD Colonel Kutyepov or Putyepov, (fnu), chief of Section 4 of the Technical Evaluation Group of the MVD Ministry; MVD Major Smiyevski, (fnu), deputy to Kutyepov; and Professor Strachovitz, (fnu), a political prisoner who was an eminent Soviet expert for aerodynamics.

5. The work of the group was based on exact data for Jumo-004 and BMW-003 engines, and special modern European and American scientific literature. However, the lack of basic scientific publications hampered the activities, especially those of the aerodynamic section.

6. Dr. Christian's design of a turbojet engine with combustion chambers and turbines in tandem arrangement formed the basis for the research activities of the team. (4) A turboprop engine for aircraft and a turbojet engine for PT boats were developed from these basic designs. However, none of these projects were completed and none of these engines were ready to be manufactured, as Professor Strachowitz, (fnu), an exacting scientist, considered the basic degrees of efficiency too high, and demanded combustion temperatures to be decreased, and the best fire resistant material to be used for turbine blades. These demands prevented one single project from being completed, and by April 1948, there were four turbojet and two turboprop engines being worked on. All of the experts doubted that any of the engine designs could be manufactured on the basis of calculated data, but they believed that the Soviets obtained many useful research guides for projects they would be able to carry out in their institutes.

7. The basic data for the designs of turbojet engines are as follows: Compression ratio: 1 to 6. The combustion chambers varied between six and seven burners, the number of turbine wheels between one and three, with constant combustion temperatures of 1,073° and 1,273° C. The following degrees of effectiveness were assumed for the engine: Compressor 85 %, turbine 80 %, exhaust nozzle 90 %, and diffuser 90 %. The adiabatic compression and expansion was calculated at 1.4 (constant value), and the specific fuel consumption at 0.008 per kg/sec gas throughput. The average number of revolutions was estimated at 7,000 rpm. All

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data were specifically calculated and then applied to an air throughput of 20 kg/sec, and some to 25 kg/sec. Each of these calculations was made for an atmospheric pressure of less than one atmosphere (abs.). All these values were too high and required a great amount of scientific finesse. In order to reduce the fuel consumption, preheaters were installed forward of the exhaust nozzle utilizing the exhaust gases from the turbine for the heating of the intake air. Furthermore, it was suggested to achieve a considerable improevment of the thermodynamical degree of efficiency by isothermal compression or, possibly, isothermal expansion in the turbine. This project would have required constant cooling by means of an additional cooling system. A circulating cooling system called Freonkreislauf was planned for this project. Another version of the project was the application of the after-burning or double combustion process. The gases would expand in a two-stage turbine behind the first ring of burning cans, would then enter the second ring of combustion chambers for second burning, and would finally expand for the second time in a single stage turbine behind the second ring of combustion chambers. (5)

8. The following data were basic for the construction of the TRDW 50 turboprop engine. The engine was designed with a seven stage axial compressor, two combustion rings, each with six individual burners, one two stage turbine, and one single stage turbine. The engine had a total length of about 6,500 mm, a diameter of about 850 mm at the compressor section, and of 1,000 to 1,100 mm at the turbine section. The compressor was 550 to 600 mm in diameter, measured up to the roots of the compressor blades, and had a length of about 1,200 mm. The compression ratio was 1 to 7, the air throughput about 20 kg/sec, and the output of the compressor about 500 hps. The total rating of the power plant was estimated at 7,500 kp, of which 5,000 could be utilized. The basic number of revolutions, first estimated at 7,500 rpm, was ultimately changed to 9,200 rpm. Ceramics were used for the guide vanes, and the impeller blades were made of nimonic steel and constructed for air cooling. The tensile strength of the turbine disk was σ max - 23 kg/mm^2. The temperature of the turbine blades was estimated at 800 to 1,000° C. Each wheel was to be fitted with 60 to 63 turbine blades. As there were numerous designs suggested for the attachment of the turbine blades to the disk, none [redacted] could remember how the turbine blades were finally attached. Research activities also included the construction of an exhaust cone, the so-called by pass. This exhaust cone was to control the propeller rotations by reversely increasing or decreasing the thrust. The diffuser was provided with oil cooling. The auxiliaries included a generator oil pump, two air compressors, a fuel control device, a revolution control device, a revolution indicator, and a four-cylinder 25 HP starter engine of the Otto type. This starter engine transmitted its power via a 20 mm hollow shaft revolving at 4,000 rpm. Two types of main shafts were finally suggested for the power plant: one type was composed of two shafts, of which one was hollow, while the other version had one shaft rigidly connected to the

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turbine and the compressor. After preliminary experiments with counter rotating propellers it was decided to use one five bladed propeller, 5,000 mm in diameter. Propeller and engine were designed for a cruising speed of 550 to 600 km/h and for a maximum speed of 950 km/h.(6) As there were no records available the construction of gears met with great difficulties, and all tabulations had to be worked out. The gear was a two stage planetary unit, which was shifted by stopping one of the two outer gear wheels. It was difficult to meet the Soviet demand of a module 5 gear, which was not to exceed a diameter of 300 mm measuring to the pitch circle of the outer ring. As far as could be remembered, the two outer gear rings were designed with 59 teech, one sun wheel on the turbine shaft had 17 and the other one 19 teeth. The transmission ratios resulting from these data were 1 to 4.48 and 1 to 4.1.(7) The assumed take-off rating of 7,000 rpm of the turbine was to be reduced to 1,600 rpm of the propeller with a transmission ratio of 1 to 4.48. The altitude rating of the turbine, which Dr. Christian estimated at 4,500 rpm, was to be reduced to 1,000 rpm of the propeller with a transmission ratio of 1 to 4.1. The first gear was designed with five and the second gear with four pinion wheels. The steel cast epicyclic unit was to be one piece with the inner propeller shaft. The three wheels of this unit were interconnected by ribs. Steel discs with brake lining were designed for the multiple disc clutches. Half of these discs geared into the teeth of a flange rigidly connected to the gear casing, while the other discs geared into the internal teeth of the other gear ring. These teeth were milled only to the pitch line. Gears were shifted by means of a hydraulic piston, which operated the discs of one of the couplings, jamming the pertaining outer gear ring against the gear casing. All gear bushings were axially movable. Planetary wheels were designed with hollow dogs, sealed with sheet metal at both open ends. A reverse gear composed of two bevel gears and three pinions was installed forward of the main gear., The pinions were bedded in a triangular frame gearing into the casing at three different points. This was designed in order to achieve an elastic bedding for the reversing gear. Oil was fed from the main bearing to the bearings and bolts of the planetary gear through bore holes in the epicyclic unit. The oil nozzles located in the bulkheads were lubricated in the same manner. These lubrication nozzles constantly transmitted the lubricant to the contact points of the running engine. No records were available on calculated gear temperatures. But the thermal strain on the gear was believed to be very high, as the gears were kept rather small in dimensions considering the high amount of power to be transformed. The lower part of the gear casing housed an air-oil separator made of sheet metal. All oil pipes leading from and to the pumps were led through holes in the casing and mouthed into the flange connecting gear section and compressor. About 200 liters of lubrication oil would circulate between gear - first stage filter - second stage filter - and oil radiator. The outer gear casing was provided with cooling ribs placed within the air flow streaming to the axial compressor. The construction of this planetary gear will probably meet with great difficulties.

9. The following suggestions were made for the utilization of the turbojet with PT boats. These boats were to be equipped with an 1,800 HP diesel engine rotating at 1,200 rpm cruising speed, and an additional jet engine with 6,000 HP and a rating of 6,800 rpm for combat action. The most important problem of this project was the gear section. The following versions were being worked on. The first version had a horizontal diesel engine in the bow and a horizontal turbojet engine in the stern of the boat. Both engines were connected to the adjustable screw through an intermediate gear. The second version was essentially the same, but had the diesel engine in the stern and the turbojet in the bow. A third version was designed with the diesel installed in a slanting position in the bow, while the turbojet engine in the stern of the ship was installed parallel to the propeller shaft. The fourth variation had two turbojet engines driving one propeller via one mutual gear, and a fifth version was developed with one diesel and two turbojet engines. The design of gears for these projects was based on epicyclic units developed for turboprop power plants. An office in Leningrad was contacted to appraise the practicability of these projects. This Leningrad office approced the designs but had doubts whether the suggested bevel gears could be produced. (8)

10. In addition to the above mentioned activities, Dr. Christian personally worked on preparations for new projects. These projects included improvements of a pulse jet power unit. Dr. Christian designed new springs to be machined in one piece, which were spot welded instead of riveted at the attachment point. The grid of the pulsejet was designed with a diameter of 900 mm. The springs were ordered from the Heintz & Blankert Firm in the French sector of Berlin. The pulsejet engines were to be installed in aircraft, either one engine at each side of the fuselage, or at each wing tip. (9) The engine was designed for small single seat fighters with a maximum speed of 1,200 km/h. The service ceiling for this speed was not known. Other activities of Dr. Christian included the construction of a standard diffuser and a supersonic diffuser. (10) He also worked on the construction of test stands for combustion chambers, and dynamic balance testing equipment for turbine blades. During the reported period Dr. Christian frequently went to Moscow. He never was accompanied by any other German scientist. The subject and the purpose of these meetings were never determined.

Other Groups of Experts at the Krasnogorsk Specialists' Camp.

11. Dr. n.c. Paul Heylandt, Graduate Engineer Helmut Friese, Graduate Engineer Joseph Koenig, and draftsman Hans [illegible] worked on liquifying installations for gases which, operating on refrigeration, were to produce liquid air, oxygen, hydrogen, and especially heavy hydrogen from industrial waste gases.

12. Architect Professor Leo, (fnu), and Graduate Engineer Spiegel, (fnu), worked on civilian construction projects.

13. Professor Jung, (fnu), who was formerly chief of the Physics Department at the Berlin Institute of Technology, a chemist, Dr. Stuhldecker, (fnu), who formerly worked at the German Army Ordnance Office, and several other chemists from this office worked on a secret project. It was only determined that problems concerning the production of chemical warfare agents were involved.

14. Engineers Dr. Kerschbaum, (fnu), and Dr. Schwarz, (fnu), worked on the transformation of direct current for long distance transmissions.

15. Dr. Busse, (fnu), who formerly worked at the Prague Institute of Technology, Department for High Frequencies, and engineers Dr. Phil Hans Krueger, Erich Neureuther, and Hans Schlesing worked on testing equipment and on production methods for decimeter waves.

16. The field of metallurgy was considered very important by the Soviets. Experts were detached to Plant No 2 in Khovrino, a northern suburb of Moscow. Among them were Graduate Engineers Hartmann, (fnu), Alfons Hoffmann, a former foundry chief, Willi Schulze, who formerly had a leading position in Upper Silesia, Dr. Ruppelt, (fnu), and 10 to 12 other German engineers. The entire extent of the projects was not determined. It was known however, that a new type of chill casting (Kokillenguss) with self smelting light metal cores was being developed. The activities in Plant No 2 ended allegedly without any success, as the plant was insufficiently equipped. The most capable engineers of this team were transferred to Karaganda.

17. Engineer Haering, (fnu), previously chief of the production section at the DKW motor vehicle plant in the Soviet Zone, worked with a group of 15 engineers on problems concerning small motors and vacuum pumps. Graduate Engineer Hermann Doerr was believed to be one of the 15 engineers.

18. In addition to the above mentioned teams, there were several experts working separatedly in their special fields: Dr. med et rer nat Guenther Fuchs and Dr. chem. Panny, (fnu), worked in the field of medical chemistry. Dr. phil. Becker, (fnu), previously assistant at the Berlin Institute of Technology, Physics Department, worked on the experimental equipment for flow tests on projectiles. Dr. Engineer Mueller, (fnu), from the Berlin Siemens Plant reconstructed circuit diagrams for German radar equipment. Graduate Engineer Viktor Winkler from the Belgrad Institute of Technology designed a sugar refinery. Meteorological measuring systems were being developed by Professor Dr. Koschmieder, (fnu). Professor Dr. Engineer Waltking, (fnu), from the Danzig Institue of Technology composed a manual on fundamental mechanics. Dr. Engineer Bodo Jordan developed automatic pilots and electric controls. Engineer Neumann, (fnu), designed, as an amateur, construction methods for fins for navy divers. Before this project was completed, he was sent to a Moscow prison. Engineer Walter Weidenfeld from Bochum worked on improved coal dressing methods. Dr. Engineer Krug, (fnu), developed a new process for producing printer's ink. Ex-colonel (Air Force) Graduate Engineer Wehl, (fnu), worked on hydraulic gears, and Dr. Engineer Krueger, (fnu), developed production methods for glue.

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19. Having completed their projects in about late 1948, most of the experts mentioned in paragraphs 11 through 18 were forced to sign civilian work contracts for the U.S.S.R. Their fate was not known. Dr. h.c. Paul Heylandt died in the specialist camp. (11)

20. In conclusion, [redacted] there are a large number of excellent Soviet scientists in the U.S.S.R., who are capable of evaluating and further developing the latest results in science. There are also enough practical experts trained for the execution of these designs. But there are no experts competent in both the theoretical and the practical field who are able to overcome difficulties arising between these two fields. The Soviets were absolutely aware of these shortcomings effecting their entire industrial efficiency. The Soviets are interested in everything else except a war. Owing to their inferiority complex, they overestimate, therefore, the industrial potential and capabilities of the Western Powers. (12)

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[redacted] Comments.

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[redacted]

(2) Dr. Christian and seven top experts worked at Plant No 22 in Kazan from where they were later transferred to Kuibyshev Upravlencneski. The latest news received from Upravlenchesky dates back to February 1951. Though it appears probable, it is reported for the first time that some of the experts worked in Chelyabinsk. Plant No 22 in Kazan manufactured Tu-4 aircraft, and, since 4-engine bombers with nose wheels, probably Tu-4s were observed in Chelyabinsk, it is believed possible, that those aircraft were also built there. This fact would explain the presence of German experts there.

[redacted]

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(4) For sketch of Dr. Christian's design of a turbojet engine see Annex 1.

(5) The reported data and ratings are considered to be theoretical only and could hardly be applied in practice. It is believed that, on a Soviet request, a new Jumo-004 version was to be developed with an increased output. This was to be accomplished by technical improvements and structural changes. For new versions of the basic jet engine see Annexes 2 and 3. For a reproduction of the combustion chamber, see Annex 4; see Annex 5 for sketch of the turbine blade, and Annex 6 for a drawing of the guide vane.

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(6) [redacted]

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[redacted]

[redacted] See also Annex 7.

For variations of the new seven-stage axial compressor turbojet see Annexes 8 and 9. The rating of 5,000 HP at an air mass flow of 20 kg/sec seems exaggerated, as does the maximum temperature of the turbine blades. From the fact that guide vanes were made of ceramics it is concluded, that the Soviets had some experience with the use of ceramic material for the construction of turbine engines.

(7) For sketches of planetary gear see Annexes 10 and 11. The number of teeth does not correspond with the transmission ratio. The reported ratio would be approximately correct, if the outer ring would have 76 teeth instead of the reported 59.

(8) For installation of turbojet engines in PT boats, see Annexes 12 and 13. It cannot be determined whether these designs were actually intended to be installed in PT boats or amphibian transport vessels, or whether they were experimental models only. However, as the Kieler Selbsthilfe Betriebe (Self help factories) had worked out similar designs for the Soviets, it is rather believed that these projects have some foundations.

(9) The Soviets ordered the Junkers Plant to develop a pulsejet unit with an improved thrust of 500 kg. The spring flap section was the greatest difficulty encountered in the project. Until 1948 all efforts in the Soviet Union had failed to develop a pulse jet engine with 50 hours flight endurance.

(10) For sketch of diffusers, see Annex 15.

(11) These teams were composed of PWs, who were forced to sign work contracts. Dr. Engineer Kerschbaum, who had refused to sign such a contract returned to Germany in 1949 after having been in the Lyubyanka Prison. At the present time Kerschbaum is director of the Munich Siemens Plant.

(12) This statement is considered to be correct if referred to the small group of Soviets met by the sources.

[redacted] 50X1-HUM

15 Annexes: fifteen blueprints [redacted]

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[redacted]ian's Group.

arch 1947, a group of 42 German experts in the field of tu
ne designs was organized under supervision of Dr. Christian
nogorsk (37°32'E/55°49'N) specialist camp and transferred to
camp near Kurgatino about 2.5 km southwest of Bolshevo (55°55'N/3
The members of the group were gradually released since early 1948, e
cept for some top experts who were still in the U.S.S.R. in early 1951.
It was believed that the members of this group were selected during a
conference held in late 1946 between Dr. Christian and Soviet Minister
Bulganin, and designers Yakovlev and Mikoyan. During this conference
Dr. Christian presented his designs of turbojet and turboprop engines. (1)

2. The German team was organized as follows:

Chief — Graduate Engineer Manfred Christian
Deputy: — Graduate Engineer Frederik Eberschulz

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Project Group:

Thermodynamics — Graduate Engineers Gerd Dimter, Helmut Friese, and

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annex 1

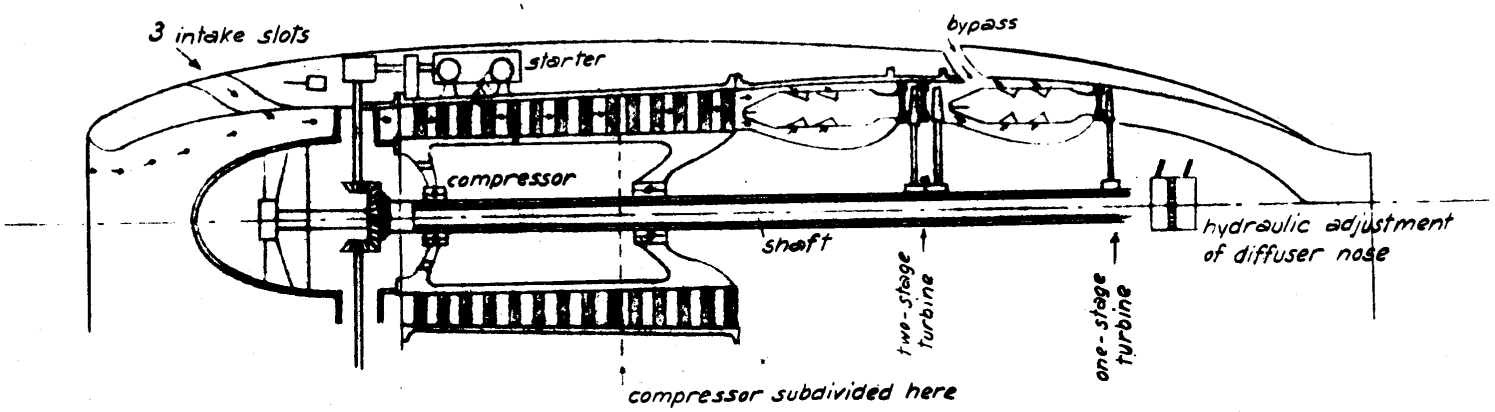

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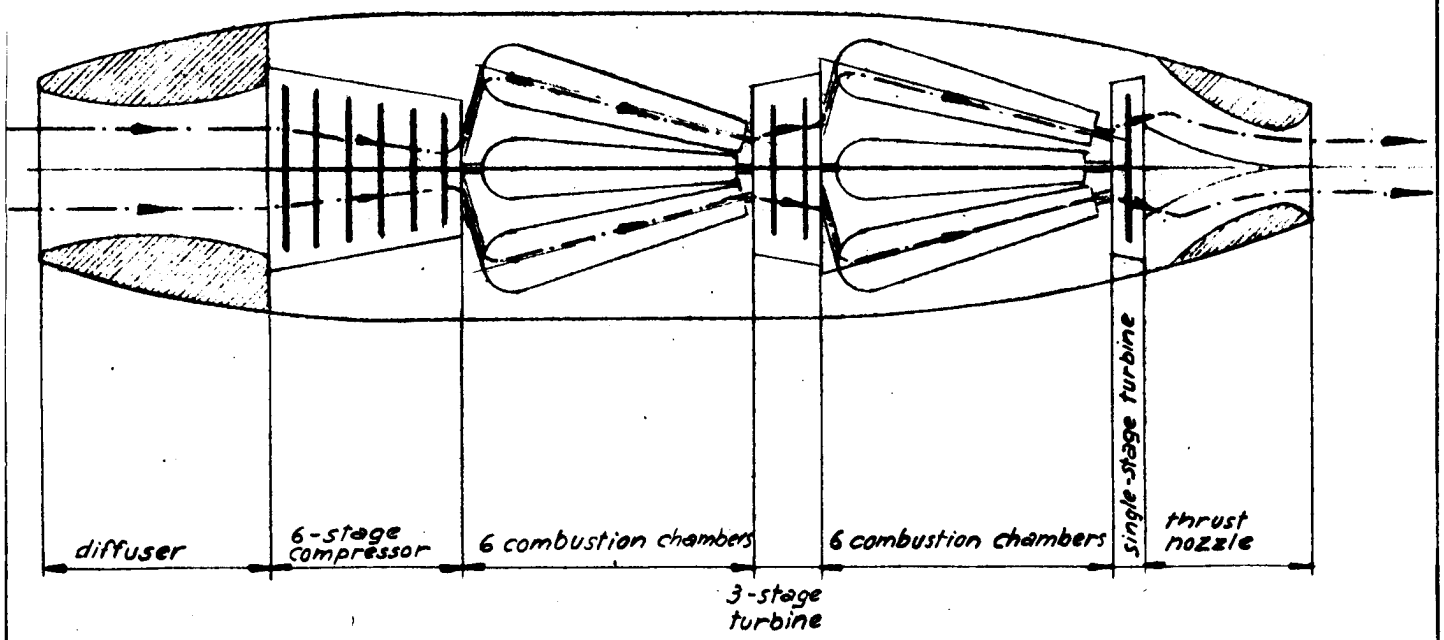
FIG. 2



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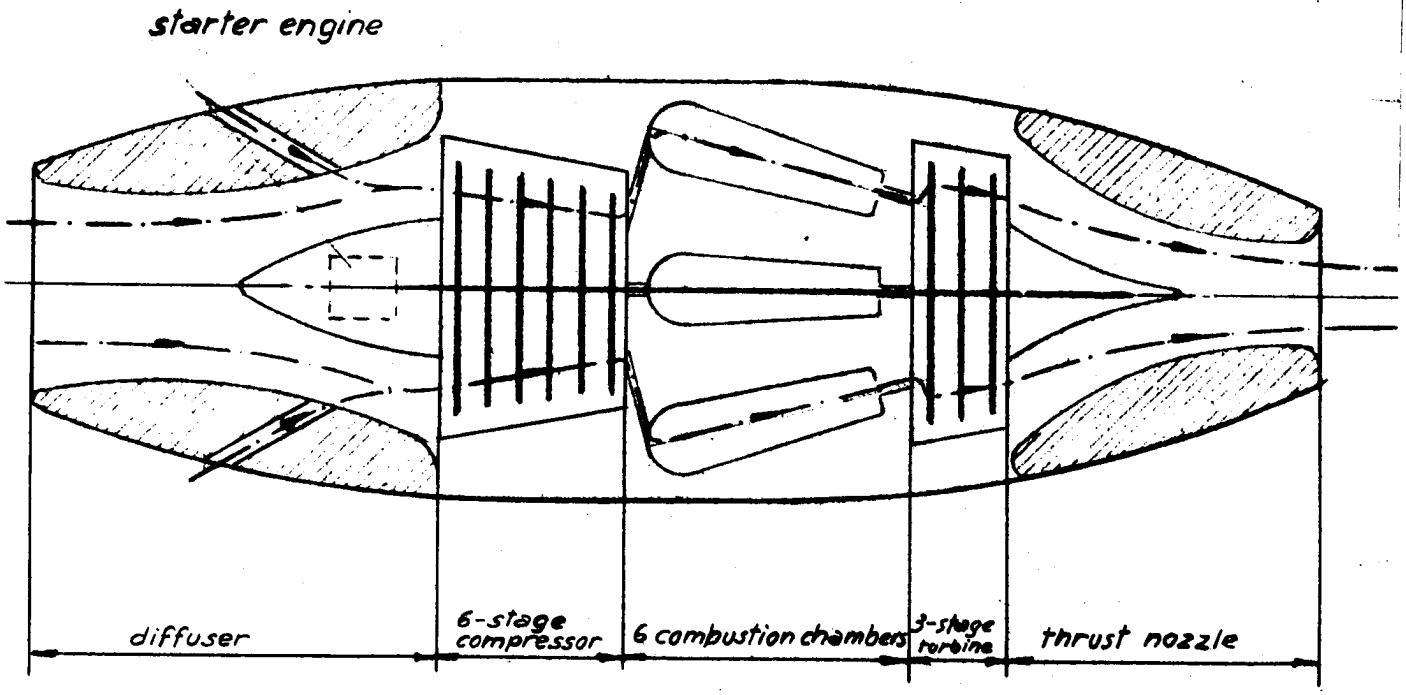
Annex 3



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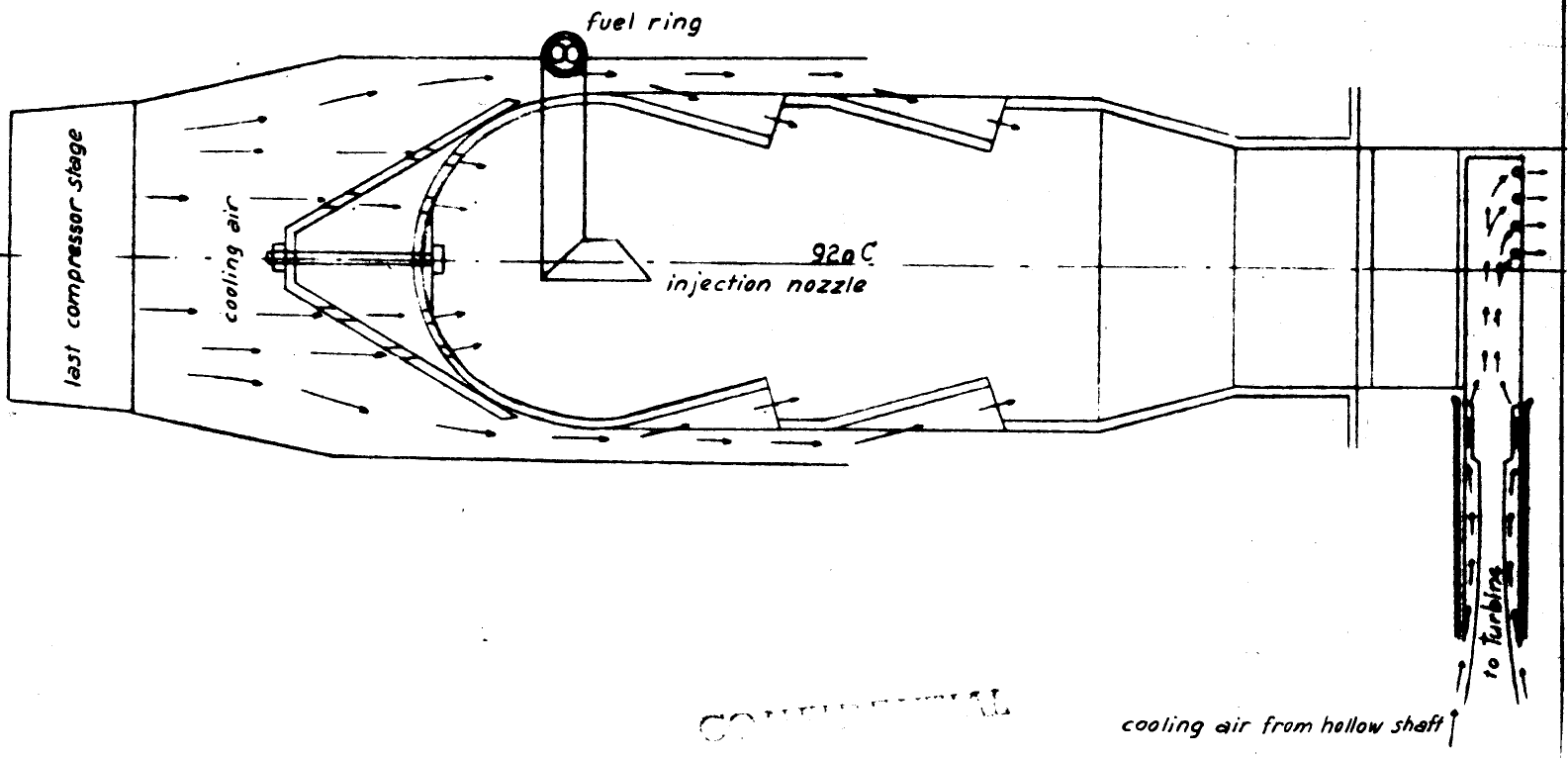
Annex 4

Combustion Chamber



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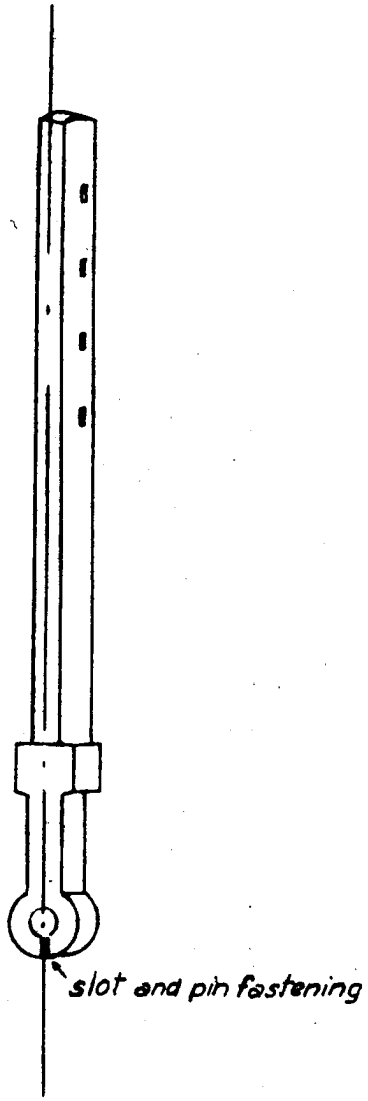
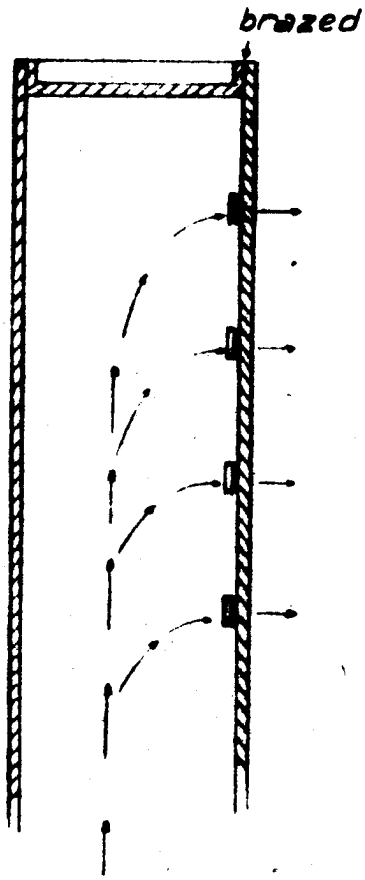
Annex 5

Air Cooled Turbine Blade





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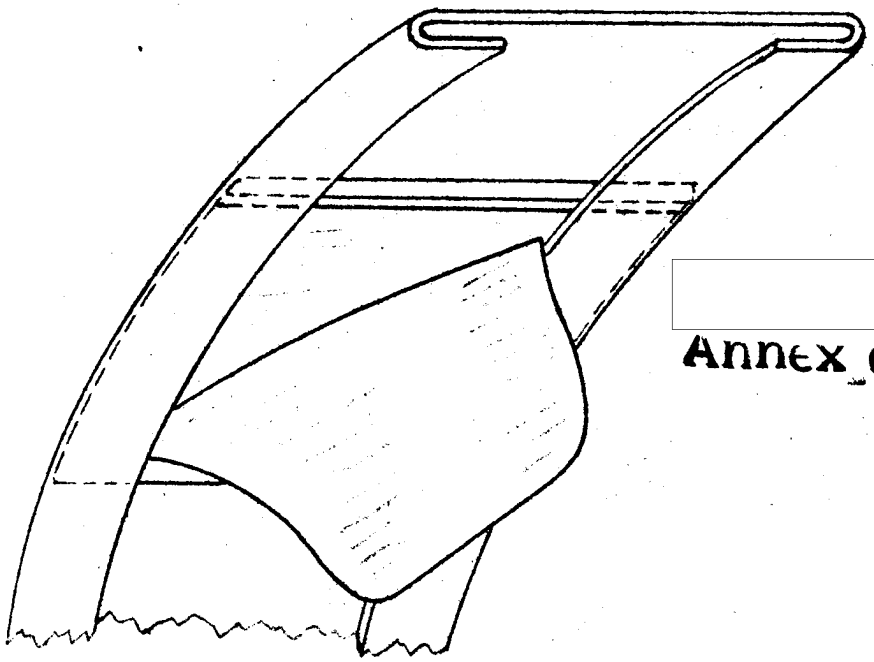

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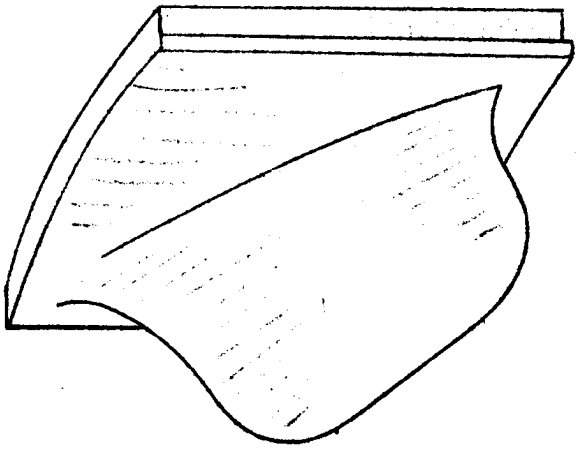
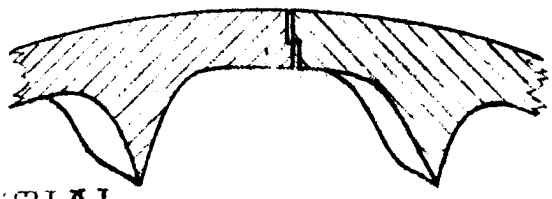
Annex 6





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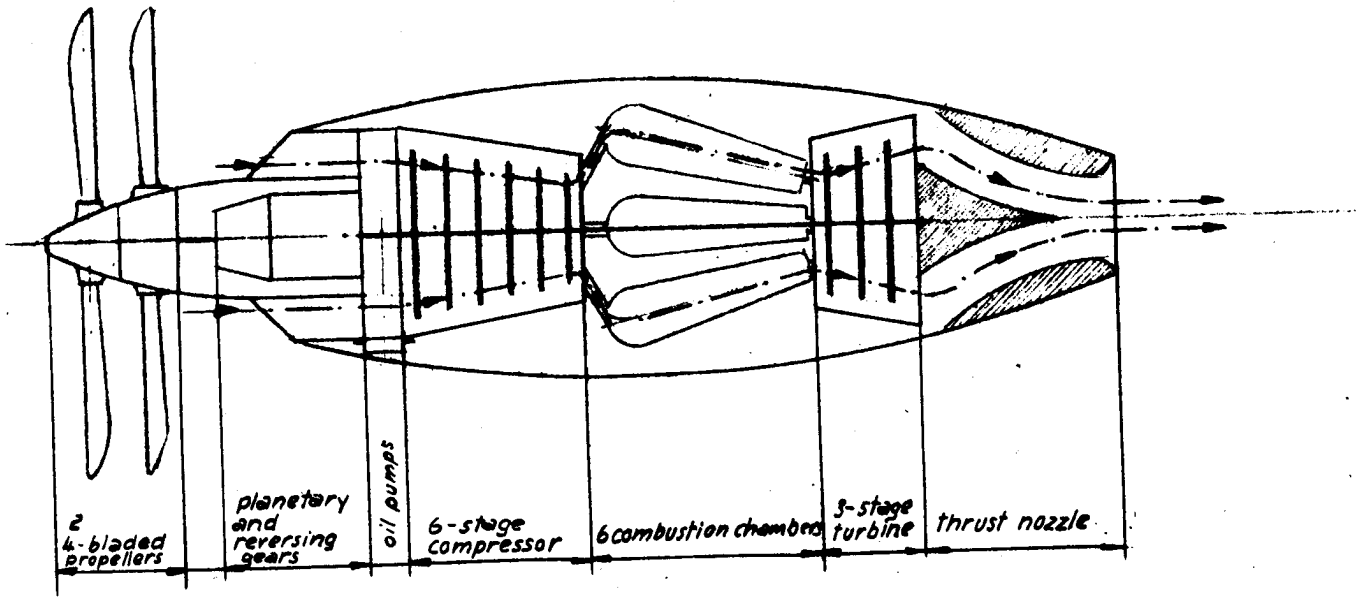
Annex 7



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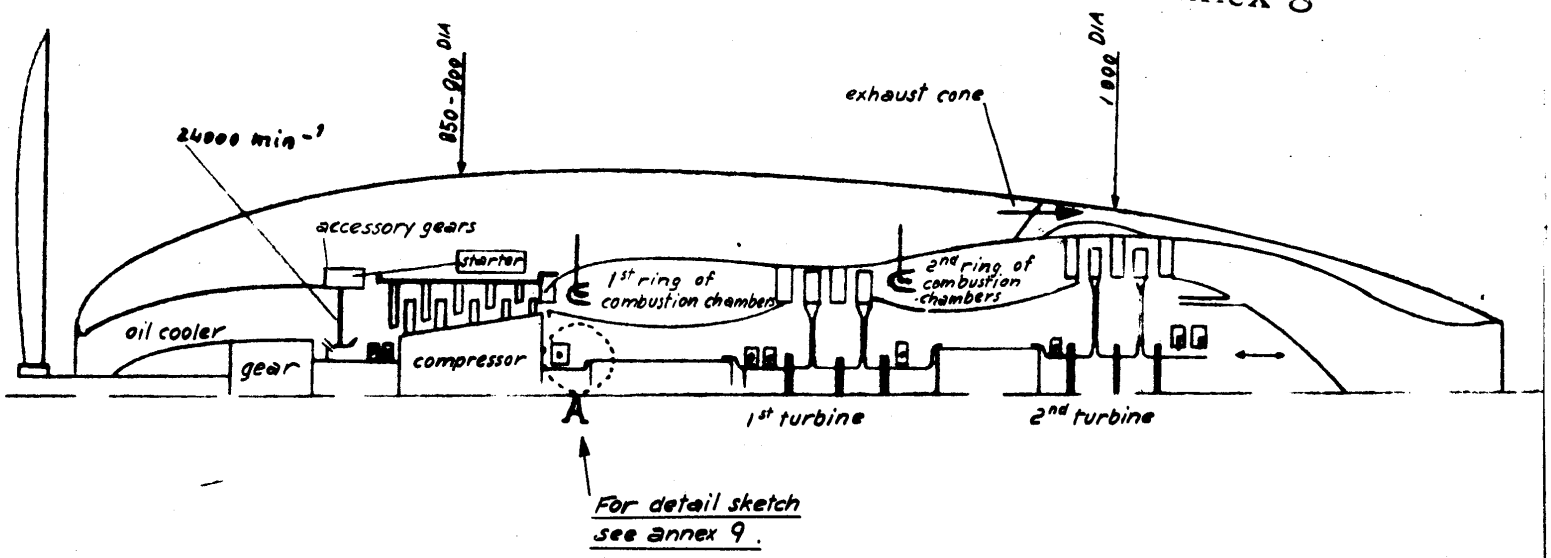
ANNEX 8



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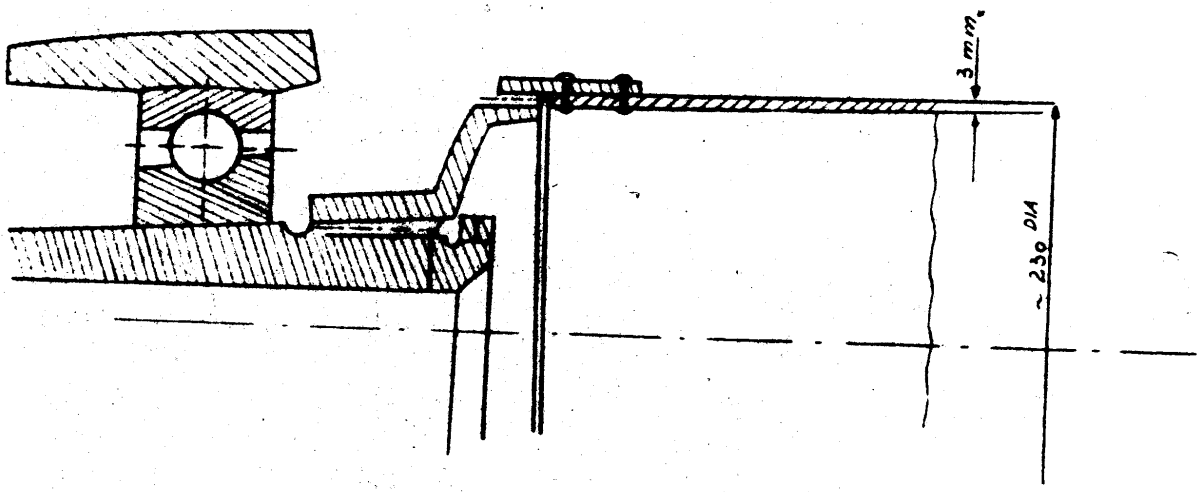
ANNEX 9

RADIAX BEARING 100 DIA / 180 DIA / 41

Detail Sketch to Annex 8



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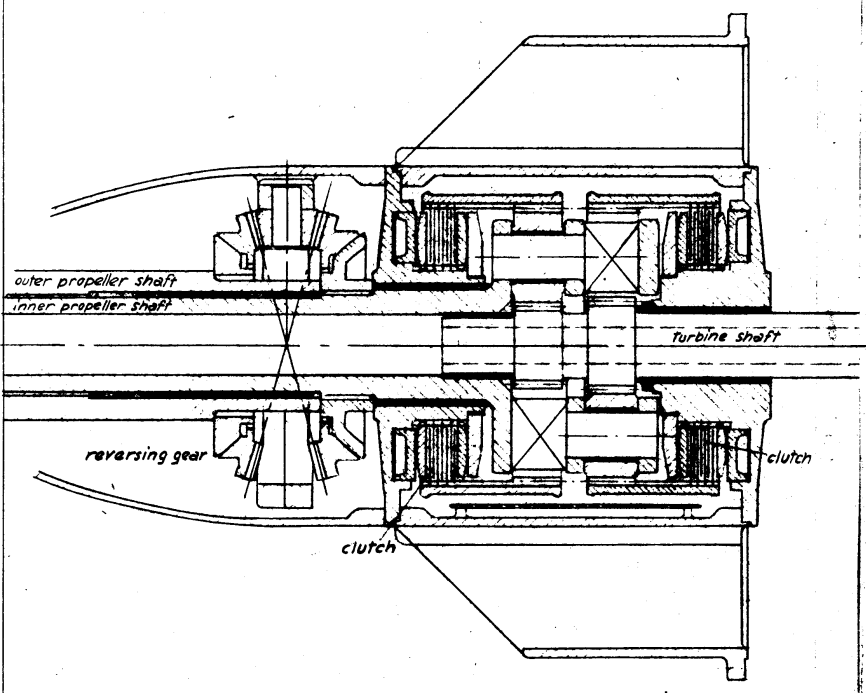
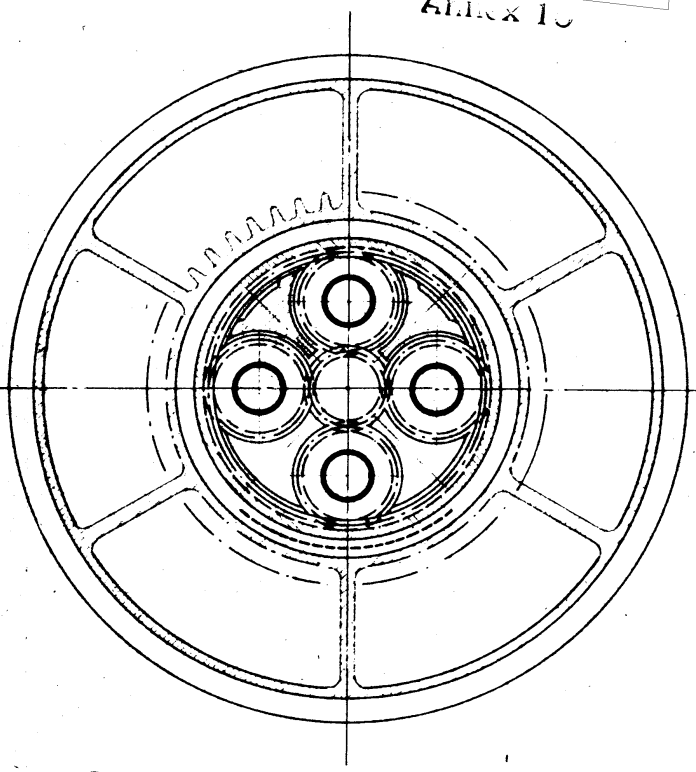
ANNEX 15





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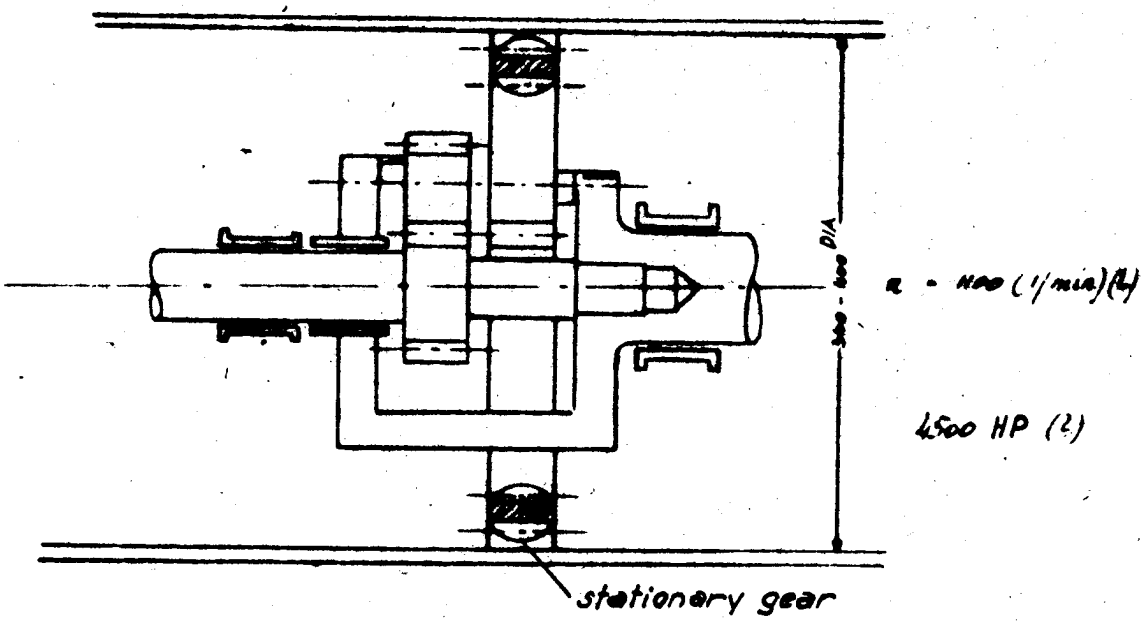
ANNEX II

PLANETARY GEAR



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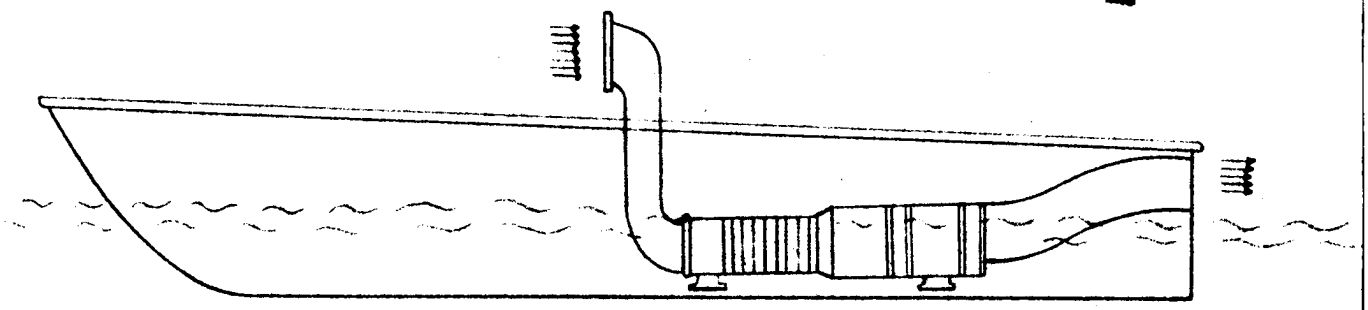
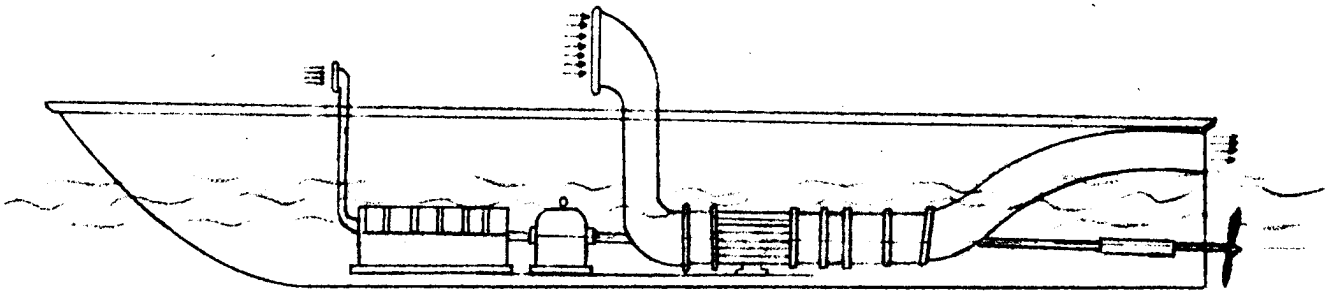
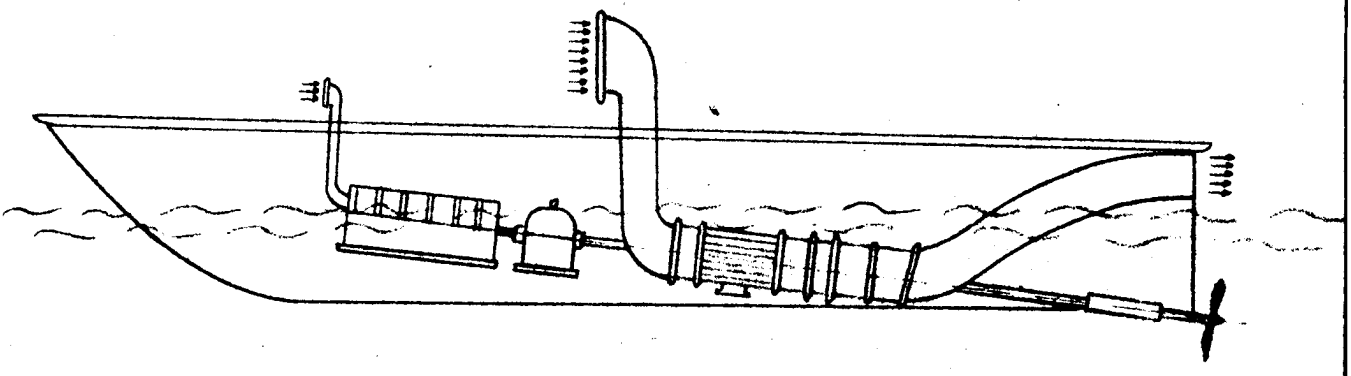
PT Boat Equipped with Turbojet Powe[redacted]

Annex 12







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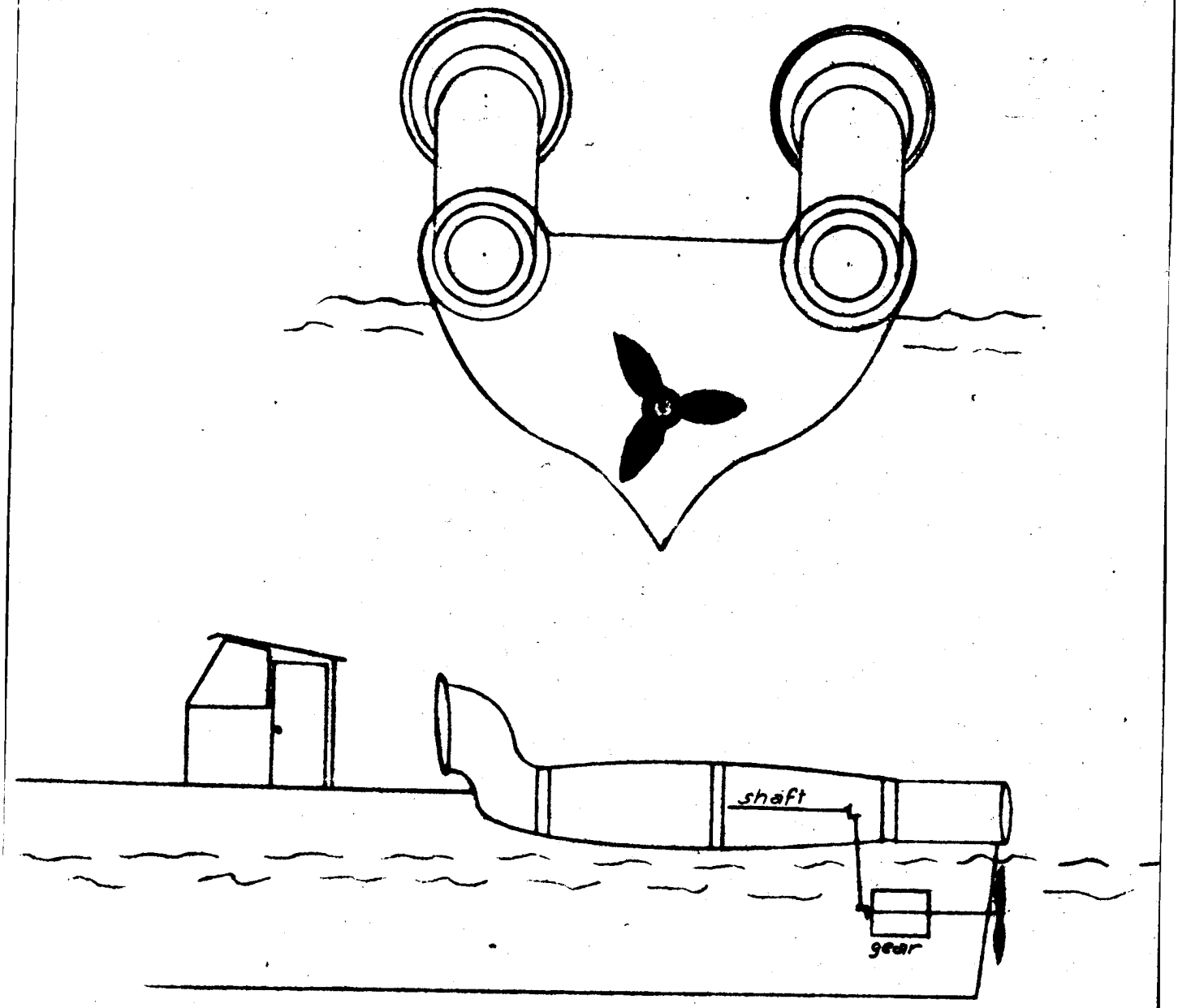
Annex 13

PT BOAT EQUIPPED WITH TWO TURBOJET POWER PLANTS



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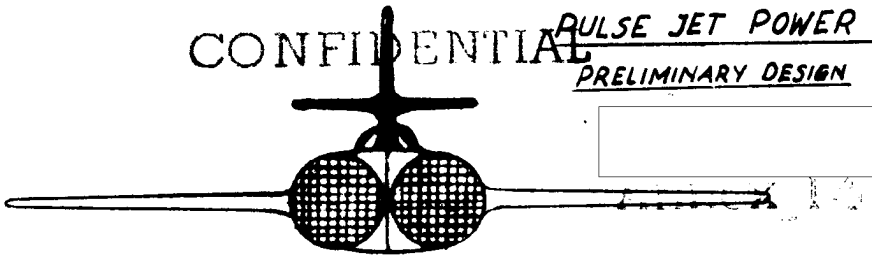
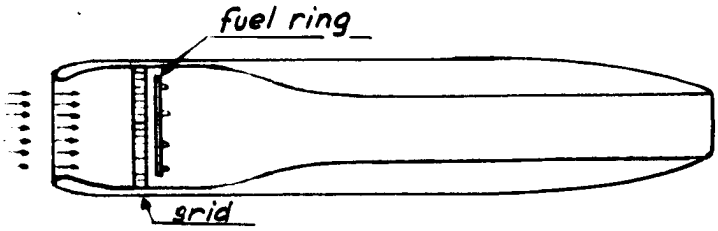
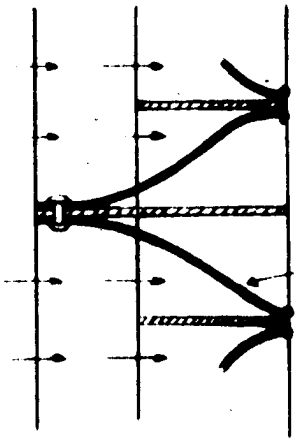
PULSE JET POWER UNIT

PRELIMINARY DESIGN



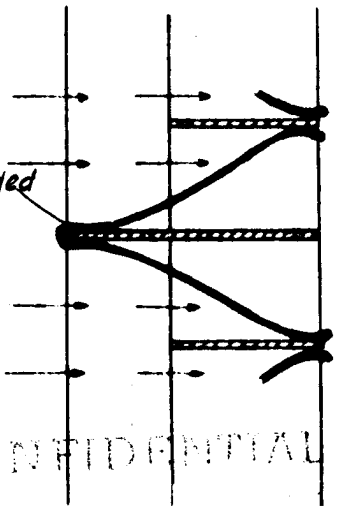


Old design with reveted springs (frequent cracks at reveted parts)



springs produced by the Heintz and Blankert firm

New design with one-piece spring, almost no cracks.



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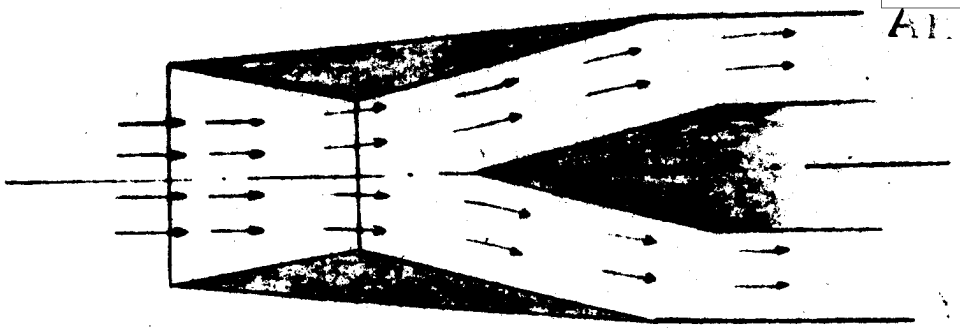
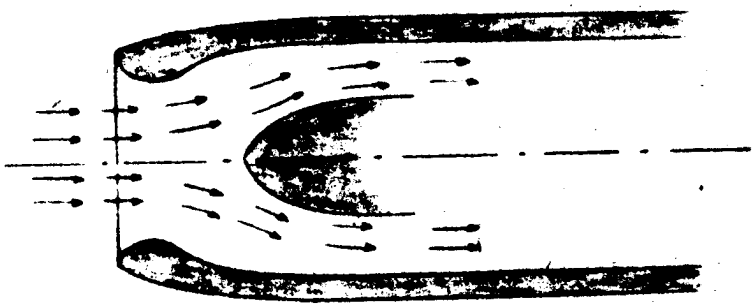
50X1-HUM

Supersonic Diffuser



Standard Diffuser



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